

PdWND1B Transcription Factor Alters Lignocellulosic Biomass and Sugar Release in *Populus*

Background

- Wood cell wall composition, which influences the conversion of lignocellulosic biomass to fuels and products, can be regulated at a molecular level via transcription factors such as wood- or secondary cell wall-associated NAC domains (WND or SND).

Approach

- The expression of NAC transcription factor *PdWND1B* was altered in *Populus* xylem tissue to characterize its role in wood-/secondary cell wall biosynthesis and its impact on the conversion of lignocellulosic biomass into biofuels (i.e., ethanol).
- Transcriptomics measurements were performed to assess changes in genomic expression resulting from *PdWND1B* regulation.

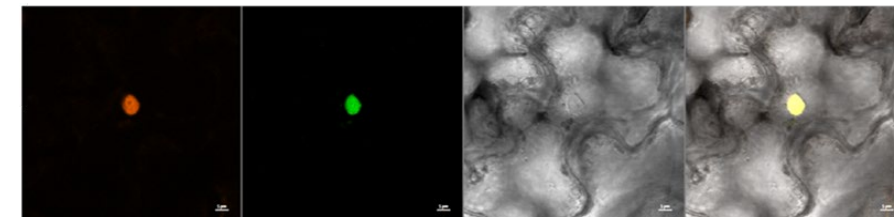
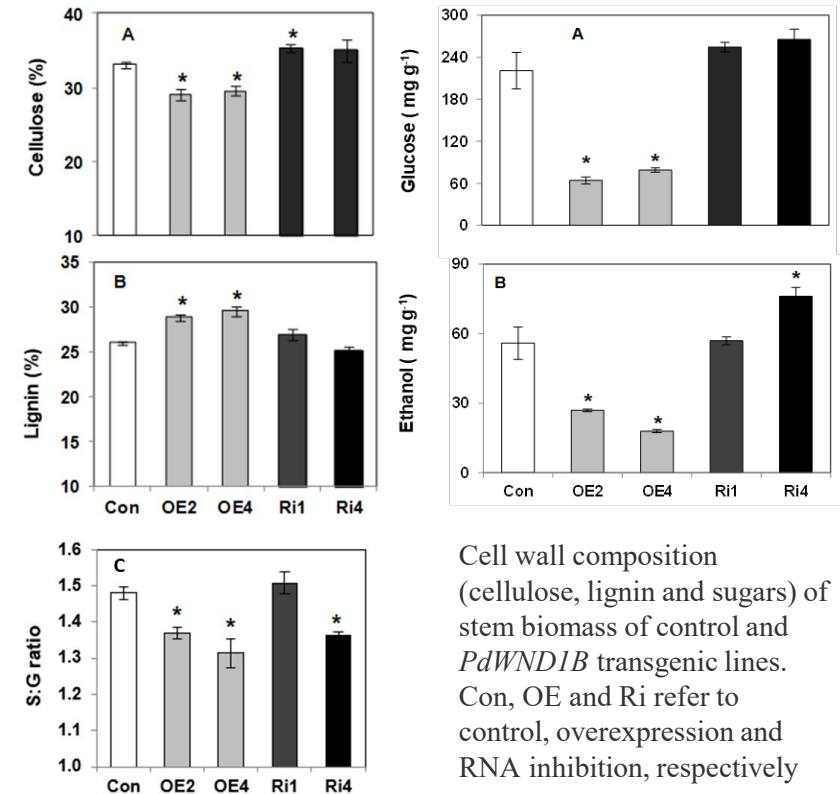
Results

- Downregulation of *PdWND1B* abundance led to a reduction in plant growth and stem biomass.
- Upregulation of *PdWND1B* reduced cellulose and increased lignin content, which reduced the amount of sugar converted to ethanol.
- Transcriptomics analyses revealed that alteration to *PdWND1B* leads to changes among other transcription factors and secondary cell wall-related genes that may explain the observed phenotypic changes in cell wall chemistry.

Significance

- *PdWND1B* is an important molecular control for consideration in biodesign or genetic improvement in secondary plant cell walls for either above or below ground performance.
- *PdWND1B* helps regulate optimized biomass productivity, cell wall chemistry, and biomass conversion to fuels including sustainable aviation fuel.

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Nuclear localization of the *PdWND1B* in tobacco mesophyll cells. (images left to right in Panel) signal from DAPI nuclear stain, signal from GFP-tagged *PdWND1B*, bright field image and colocalization of DAPI and GFP signals.